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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/988,924	11/19/2001	Christopher J. Orlick	MATP-612US	9367

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RATNERPRESTIA
P O BOX 980
VALLEY FORGE, PA 19482-0980

EXAMINER	
TRAN, TRANG U	
ART UNIT	PAPER NUMBER
2622	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	09/988,924	ORLICK ET AL.	
	Examiner	Art Unit	
	Trang U. Tran	2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-24 and 26-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *18 and 28-31* is/are allowed.

6)☒ Claim(s) *1-7, 13-16 and 19-24* is/are rejected.

7)☒ Claim(s) *9-12,17,26,27 and 30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Under the auspices of the TC 2600 director, the petition filed May 03, 2005 has been construed as a request for reconsideration. The request is found persuasive and thus the restriction requirement of August 25, 2004 is hereby withdrawn.

Response to Arguments

2. Applicant's arguments with respect to claims 1-7 and 19-24 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 13-15 are rejected under 35 U.S.C. 102(e) as being anticipate by Jiang et al. (US Patent No. 6,421,090 B1).

In considering claim 13, Jiang et al discloses all the claimed subject matter, note 1) the claimed determining a degree of movement in a region of a target picture element (pixel) position between a last displayed image and a current image is met by the motion value of target pixel is detected in step 22 (Figs. 2-4, col. 5, line 57 to col. 7, line 40), 2) the claimed generating an intra-field interpolated pixel value for the target pixel

position is met by the intra-field interpolation step (edge interpolation) (col. 9, lines 4-32), 3) the claimed generating an inter-field interpolated pixel value for the target pixel position is met by the inter-field interpolation (Else step), if motion is very low, all of the value of pixel X is determined from its value C in the next field (col. 9, lines 4-32), and 4) the claimed combining the intra-field interpolated pixel value and the inter-field interpolated pixel value in a proportion determined by the degree of movement in the region to produce an output interpolated pixel value for the progressive scan video image is met by the step of combining both intra-field and inter-field values for each pixel in a frame, weighted by the detected motion at the pixel and the detected edge (col. 9, lines 4-32).

In considering claim 14, Jiang et al discloses all the claimed subject matter, note 1) the claimed wherein the step of determining a degree of movement in the region of the target pixel position between a previously displayed image and the interlace scan image includes a steps of: selecting a plurality of corresponding pixel positions in the region of the interlace scan image and in a corresponding region of the previously displayed image is met by segmenting pixels together by analyzing groups of pixels around pixel X for succession of fields (Figs. 3-4, col. 6, lines 10-38), 2) the claimed generating a respective plurality difference values, each representing a difference between one of the selected pixel positions in the interlace scan image and the respective corresponding pixel position in the previously displayed image values is met by the differences between respective pairs of segments of pixel adjacent (or containing) pixel X from successive fields (blocks 202c-202f of Fig. 4, col. 6, lines 39-

59), 3) the claimed determining a maximum difference value of the plurality of difference values is met by the maximum difference values (block 208 of Fig. 4, col. 6, lines 59-67), and 4) the claimed comparing the maximum difference value to multiple respectively different threshold values to determine the degree of movement in the region of the target pixel position is met by the reloadable look-up table 210 (Fig. 4, col. 7, lines 1-41).

In considering claim 15, the claimed wherein the step of generating an inter-field interpolation value includes the step of generating a field-merge interpolation value is met by the inter-field interpolation (Else step), if motion is very low, all of the value of pixel X is determined from its value C in the next field (col. 1, lines 25-38 and col. 9, lines 4-32).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. (US Patent No. 6,421,090 B1) in view of Kim et al (US Patent No. 5,786,862).

In considering claim 16, Jiang et al disclose all the limitations of the instant invention as discussed in claims 13-14 above, except for providing the claimed wherein the step of generating an inter-field interpolation value includes the step of generating a non-linear interpolation value. Kim et al teach that initially, interpolation methods were

developed for NTSC systems, thereafter, various interpolation methods have been proposed which have in common restoring through interpolation lines omitted during an interlaced scan, conventional interpolation methods are described in the following references: [1] simple line doubling scheme..., [2] edge direction dependent deinterlacing method..., [3] non-linear interpolation methods..., [4] a motion adaptive method (col. 1, lines 21-60). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to incorporate the old and well known of using a non-linear interpolation value as taught by Kim et al into Jiang et al's system in order to increase the flexibility of the system by using difference interpolation methods.

7. Claims 1-2, 4-5, 7, 19-20 and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. (US Patent No. 6,421,090 B1) in view of DeHaan et al (US Patent No. 5,280,350).

In considering claim 1, Jiang et al discloses all the claimed subject matter, note 1) the claimed (a) determining whether a target picture element (pixel) position of an interpolated row of pixels lies on an edge between visually distinct regions is met by the detected edge direction step 24 (Figs. 2 and 5a-5b, col. 5, line 65 to col. 6, line 9 and col. 7, line 42 to col. 9, line 3), 2) the claimed (b) determining a degree of movement in the region of the target pixel position between a previously displayed image and the interlace scan image is met by the motion value of target pixel is detected in step 22 (Figs. 2-4, col. 5, line 57 to col. 7, line 40), 3) the claimed (c) generating a plurality of potential values for an interpolated pixel at the target pixel position is met by the step 26 which performs edge adaptive interpolation and step 27 which perform motion adaptive

interpolation (col. 9, lines 4-32), and 4) the claimed (d) selecting at least one potential value from the plurality of potential values for the interpolated pixel responsive to the determination of whether said target pixel position lies on an edge and the determined degree of movement in the region of the target pixel position is met by the step of combining both intra-field and inter-field values for each pixel in a frame, weighted by the detected motion at the pixel and the detected edge (col. 9, lines 4-32).

However, Jiang explicitly does not disclose the newly added claimed filtering the interpolated pixel value to reduce errors in the interpolated pixel resulting from electrical noise in the interlace scan video image.

DeHaan et al teach that the present invention provides a new method and apparatus for obtaining the pixel value X on that new line, the method of the invention basically consists of two steps: obtain by motion compensated interpolation an interpolated value from at least the neighboring field I, and performing a spatial filtering on the interpolated value to remove artifacts caused by motion estimation errors (Figs. 1-2, col. 2, line 23 to col. 4, line 67).

Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to incorporate the filter for filtering interpolated pixel as taught by DeHaan et al into Jiang et al's system in order to provide a better picture display quality by reducing interpolation errors during the conversion of an image from interlaced scan to progressive scan video image.

In considering claim 2, Jiang et al discloses all the claimed subject matter, note 1) the claimed wherein step (c) includes the steps of: generating an edge interpolation

value is met by the step 26 which performs edge adaptive interpolation (col. 9, lines 4-32), 2) the claimed generating an inter-field interpolation value is met by the inter-field interpolation (Else step), if motion is very low, all of the value of pixel X is determined from its value C in the next field (col. 9, lines 4-32), 3) the claimed generating an intra-field interpolation value is met by the intra-field interpolation step (edge interpolation) (col. 9, lines 4-32), and step (d) includes the step of selecting the edge interpolation value responsive to the determination that the target pixel position lies on an edge is met by the step 26 which performs edge adaptive interpolation (col. 9, lines 4-32 of Jiang et al).

In considering claim 4, the claimed which step (d) includes the steps of: selecting the intra-field interpolation value and the inter-field interpolation value, and blending the intra-field interpolation value and the inter-field interpolation value according to the degree of movement determined in step (b) to generate the value for the interpolated pixel is met by the step of combining both intra-field and inter-field values for each pixel in a frame, weighted by the detected motion at the pixel and the detected edge (col. 9, lines 4-32 of Jiang et al).

In considering claim 5, the claimed wherein the step of generating an inter-field interpolation value includes the step of generating a field-merge interpolation value is met by the inter-field interpolation (Else step), if motion is very low, all of the value of pixel X is determined from its value C in the next field (col. 1, lines 25-38 and col. 9, lines 4-32 of Jiang et al).

In considering claim 7, Jiang et al discloses all the claimed subject matter, note 1) the claimed wherein the step of determining a degree of movement in the region of the target pixel position between a previously displayed image and the interlace scan image includes a steps of: selecting a plurality of corresponding pixel positions in the region of the interlace scan image and in a corresponding region of the previously displayed image is met by segmenting pixels together by analyzing groups of pixels around pixel X for succession of fields (Figs. 3-4, col. 6, lines 10-38), 2) the claimed generating a respective plurality difference values, each representing a difference between one of the selected pixel positions in the interlace scan image and the respective corresponding pixel position in the previously displayed image values is met by the differences between respective pairs of segments of pixel adjacent (or containing) pixel X from successive fields (blocks 202c-202f of Fig. 4, col. 6, lines 39-59), 3) the claimed determining a maximum difference value of the plurality of difference values is met by the maximum difference values (block 208 of Fig. 4, col. 6, lines 59-67), and 4) the claimed comparing the maximum difference value to multiple respectively different threshold values to determine the degree of movement in the region of the target pixel position is met by the reloadable look-up table 210 (Fig. 4, col. 7, lines 1-41).

In considering claim 19, Jiang et al discloses all the claimed subject matter, note 1) an edge detector that determines whether a target picture element (pixel) position of an interpolated row of pixels lies on an edge between visually distinct regions of a current image defined by the interlace scan video signal to provide an edge flag is met

by the detected edge direction step 24 (Figs. 2 and 5a-5b, col. 5, line 65 to col. 6, line 9 and col. 7, line 42 to col. 9, line 3), 2) the claimed a motion detector that determines a degree of movement in a further region of the current image containing the target pixel position between a previously displayed image and a current image to provide a static level value is met by the motion value of target pixel is detected in step 22 (Figs. 2-4, col. 5, line 57 to col. 7, line 40), 3) the claimed a plurality of pixel interpolators which generate a plurality of potential values for an interpolated pixel at the target pixel position, each potential value being generated by a respectively different method is met by the step 26 which performs edge adaptive interpolation and step 27 which perform motion adaptive interpolation (col. 9, lines 4-32), and 4) the claimed a selector which selects at least one potential value from the plurality of potential values for the interpolated pixel responsive to the edge flag and the static level value is met by the step of combining both intra-field and inter-field values for each pixel in a frame, weighted by the detected motion at the pixel and the detected edge (col. 9, lines 4-32).

However, Jiang explicitly does not disclose the newly added claimed filtering the interpolated pixel value to reduce errors in the interpolated pixel resulting from electrical noise in the interlace scan video image.

DeHaan et al teach that the present invention provides a new method and apparatus for obtaining the pixel value X on that new line, the method of the invention basically consists of two steps: obtain by motion compensated interpolation an interpolated value from at least the neighboring field I, and performing a spatial filtering

on the interpolated value to remove artifacts caused by motion estimation errors (Figs. 1-2, col. 2, line 23 to col. 4, line 67).

Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to incorporate the filter for filtering interpolated pixel as taught by DeHaan et al into Jiang et al's system in order to provide a better picture display quality by reducing interpolation errors during the conversion of an image from interlaced scan to progressive scan video image.

Claim 20 is rejected for the same reason as discussed in claim 2 above.

Claim 23 is rejected for the same reason as discussed in claim 7 above and further the claimed wherein the static level value is provided responsive to the further comparators that have respective threshold values which are less than the maximum difference value is met by the reloadable look-up table 210 (Fig. 4, col. 7, lines 1-41 of Jiang et al).

In considering claim 24, the claimed wherein the selector selects the intra-field interpolation value and the inter-field interpolation value and further includes a weighted averaging circuit which blends the intra-field interpolation value and the inter-field interpolation value in proportion to the static level value to generate the value for the interpolated pixel is met by the step of combining both intra-field and inter-field values for each pixel in a frame, weighted by the detected motion at the pixel (col. 9, lines 4-32 of Jiang et al).

8. Claims 6 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. (US Patent No. 6,421,090 B1) in view of DeHaan et al (US Patent No. 5,280,350), and further in view of Kim et al. (US Patent No. 5,786,862).

In considering claim 6, the combination of Jiang et al and DeHaan et al disclose all the limitations of the instant invention as discussed in claims 1 and 4 above, except for providing the claimed wherein the step of generating an inter-field interpolation value includes the step of generating a non-linear interpolation value. Kim et al teach that initially, interpolation methods were developed for NTSC systems, thereafter, various interpolation methods have been proposed which have in common restoring through interpolation lines omitted during an interlaced scan, conventional interpolation methods are described in the following references: [1] simple line doubling scheme..., [2] edge direction dependent deinterlacing method..., [3] non-linear interpolation methods..., [4] a motion adaptive method (col. 1, lines 21-60). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to incorporate the old and well known of using a non-linear interpolation value as taught by Kim et al into the combination of Jiang et al and DeHaan et al's system in order to increase the flexibility of the system by using difference interpolation methods.

In considering claim 21, the combination of Jiang et al and DeHaan et al disclose all the limitations of the instant invention as discussed in claims 19 and 20 above, except for providing the claimed wherein the inter-field interpolator is selected from a group consisting of a field merge interpolator and a non-linear interpolator. Kim et al teach that initially, interpolation methods were developed for NTSC systems, thereafter,

various interpolation methods have been proposed which have in common restoring through interpolation lines omitted during an interlaced scan, conventional interpolation methods are described in the following references: [1] simple line doubling scheme..., [2] edge direction dependent deinterlacing method..., [3] non-linear interpolation methods..., [4] a motion adaptive method (col. 1, lines 21-60). Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to incorporate of using a non-linear interpolation value as taught by Kim et al into the combination of Jiang et al and DeHaan et al's system in order to increase the flexibility of the system by using difference interpolation methods.

9. Claims 3 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jiang et al. (US Patent No. 6,421,090 B1) in view of DeHaan et al (US Patent No. 5,280,350), and further in view of Shin et al. (US Patent No. 6,731,342 B2).

In considering claim 3, Jiang et al disclose all the claimed subject matter, note 1) the claimed wherein: step (a) includes the steps of: generating a vertical edge strength value for the target pixel position is met by the calculation of the respective differences between three pairs of pixels about pixel X (256a, 256b, 256c) along a 135 degree axis (as measured from vertical) (Figs. 5-6, col. 7, line 42 to col. 8, line 11), 2) the claimed comparing the vertical edge strength value to a threshold value is met by the comparisons of pixel pairs against an edge threshold 318 (Figs. 5-6, col. 8, line 8 to col. 9, line 3), 3) the claimed determining that the target pixel position lies on an edge if at least the vertical edge strength value exceeds a predetermined threshold value is met by the compare and decoding logic 320 (Figs. 5-6, col. 8, line 8 to col. 9, line 3), 4) the

claimed determining an angle of the edge responsive to the vertical edge strength value and the horizontal edge strength value is met by is met by the calculation of the respective differences between three pairs of pixels about pixel X (256a, 256b, 256c) along a 135 degree axis (as measured from vertical) (Figs. 5-6, col. 7, line 42 to col. 9, line 3), and 5) the claimed generating the edge interpolation value responsive to pixels in the interlace scan image that lie along the determined angle is met by edge adaptive interpolation (col. 9, lines 4-32).

However, the combination of Jiang et al and DeHaan et al explicitly do not disclose the claimed generating a horizontal edge strength value for the target pixel position and determining that the target pixel position lies on an edge if at least the horizontal edge strength value exceeds a predetermined threshold value.

Shin et al teach that the spatial interpolator 34 detects the edge direction by using the correlation of the intra-field pixels, the spatial interpolator 34 finds the correlation about pixels adjacent upper, lower, left, right centering around the pixel to be interpolated in order to judge where the pixel to be interpolated is included among the three directions, and judges whether the pixel to be interpolated is included in a vertical or horizontal edge (Figs. 4-7, col. 7, line 10 to col. 12, line 54).

Therefore, it would have been obvious to one ordinary skill in the art at the time of the invention to incorporate the horizontal edge detector as taught by Shin et al into the combination of Jiang et al and DeHaan et al's system in order to increase the quality of the video signal by improving the performances of edge direction detection and pixel interpolation.

Claim 22 is rejected for the same reason as discussed in claim 3.

Allowable Subject Matter

10. Claims 9-12, 17, 26-27 and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Each dependent claims 9 and 26 identifies the uniquely distinct features: "wherein the step of filtering the interpolated pixel includes the steps of: if the target pixel position is determined to lie on an edge between visually distinct regions, comparing the interpolated pixel and other pixels in the interlace scan image to a plurality of edge masks to generate a respective plurality of correlation values, and if none of the plurality of correlation values exceeds a predetermined threshold value, calculating a new value for the interpolated pixel". The closest prior art, Jiang et al. (US Patent No. 6,421,090 B1), DeHaan et al (US Patent No. 5,280,350) and Shin et al. (US Patent No. 6,731,342 B2), either singularly or in combination, fail to anticipate or render the above underlined limitations obvious.

11. Claims 18 and 28-31 are allowed.

Each independent claims 18 and 31 identifies the uniquely distinct features: "determining respective minimum, maximum and median values for respective sets of pixel values, each set of pixel values including respective pixel values for pixel positions vertically adjacent to the target pixel position in the interlace scan image and the sets including respective pixel positions from a previous frame that include the target pixel position and pixel positions horizontally adjacent to the target pixe] position; determining

respective difference values between the maximum and minimum values for each set of pixel values; and selecting, as the non-linear interpolated value, the median value from the set having the difference value that is less than any other one of the difference values". The closest prior art, Jiang et al. (US Patent No. 6,421,090 B1), DeHaan et al (US Patent No. 5,280,350) and Shin et al. (US Patent No. 6,731,342 B2), either singularly or in combination, fail to anticipate or render the above underlined limitations obvious.

The independent claim 28 identifies the uniquely distinct features: "an intra-field interpolator which generates an intra-field interpolated pixel value; and a non-linear interpolator which generates an non-linear interpolated pixel value; a weighted averaging circuit that combines the intra-field interpolated pixel value and the non-linear interpolated pixel value in proportion to the static level value to produce an output interpolated pixel value for the progressive scan video image". The closest prior art, Jiang et al. (US Patent No. 6,421,090 B1), DeHaan et al (US Patent No. 5,280,350) and Shin et al. (US Patent No. 6,731,342 B2), either singularly or in combination, fail to anticipate or render the above underlined limitations obvious.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trang U. Tran whose telephone number is (571) 272-7358. The examiner can normally be reached on 8:00 AM - 5:30 PM, Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Ometz can be reached on (571) 272-7593. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

March 7, 2007

Trang U. Tran
Primary Examiner
Art Unit 2622